



males and five females which passed through four molts, of five males and five females which passed through five molts, and of one female which molted six times, is copied from a previous paper (1).

Five specimens of *Diapheromera femorata* were reared at a high but not constant temperature. In this experiment, the walking-sticks were bred above a paraffine oven, the temperature in this region varying between 25 and 35 degrees C. The following table shows the interval, in days, between molts and the total duration of the stadia.

TABLE II.  
STAGES IN DAYS BETWEEN MOLTS OF DIAPHEROMERA FEMORATA  
REARED UNDER A HIGH TEMPERATURE OF 25° TO 35° C.

Date of Hatching	Sex	Number of Molts	Stadium I	Stadium II	Stadium III	Stadium IV	Stadium V	Stadium VI	Post-embryonic development	Date of Last Molt
May 4, 1910	♂	5	7	7	6	9	8		37	June 10
" " "		5	12	7	10	7	8		44	
Averages			9.5	7	8	8	8		40.5	
May 3, 1910	♂	6	12	7	8	7	7	7	48	" 20
" 16, "		6	9	8	7	6	7	9	46	
Averages			10.5	7.5	7.5	6.5	7	8	47	
May 13, 1910	♀	6	10	10	7	7	7	9	50	" 2

A glance at the averages of the post-embryonic developments in the following table shows that the male walking-sticks which passed through four molts under nearly normal conditions required about the same amount of time (40.6 days) as the male specimens which molted five times under a high temperature (40.5 days). Practically the same results were obtained with the male and female Phasmids which passed through five molts under nearly normal conditions, and six molts under a high temperature (Table III). If the averages of corresponding stadia of the male individuals which molted four and five times under a nearly normal and a high tem-

perature are compared in the following table, it is seen that the interval between molts is considerably shorter under a high temperature. The same is true, with two exceptions, of the male and female walking-sticks which passed through five molts under nearly normal conditions and six molts under a high temperature (Table III).

One would not hesitate to conclude from these results that *a high temperature shortens, on an average, the interval between molts.*

TABLE III.

AVERAGES IN DAYS OF THE STAGES BETWEEN MOLTS OF DIAPHEROMERA FEMORATA REARED UNDER NEARLY NORMAL CONDITIONS AND A HIGH TEMPERATURE OF 25° TO 35° C.

Temperature	Sex	Number of Molts	Stadium I	Stadium II	Stadium III	Stadium IV	Stadium V	Stadium VI	Post-embryonic development
Normal High	♂♂	4	12.6	7.6	10	10.4			40.6
		5	9.5	7	8	8	8		40.5
Normal High	♂♂	5	9.8	8	8.2	9.8	11		46.8
		6	10.5	7.5	7.5	6.5	7	8	47
Normal High	♀♀	5	11.6	8.4	8.8	9.2	11.4		49.4
		6	10	10	7	7	7	9	50

De Sinéty (2) reared a walking-stick, *Leptynia attenuata*, at 30 degrees C. and found that, while the specimen completed its development more quickly under these conditions, yet the acceleration in development did not affect the interval between the four molts equally. He writes, "tandis que le premier est peu abrégé, le deuxième et le troisième le sont beaucoup et le quatrième est allongé."

In another experiment, ten male and five female walking-sticks were reared during the somewhat colder months of April, May and the early part of June. The following table shows the interval between molts and the post-embryonic development of each group of walking-sticks, the grouping being made according to sex and the number of molts.

If the averages of the post-embryonic developments of the male walking-sticks which molted five times under nearly normal conditions are compared in the following table with those of the male specimens that passed through four molts while exposed to a low temperature, it will be seen that the former

TABLE IV.

STAGES IN DAYS BETWEEN MOLTS OF DIAPHEROMERA FEMORATA REARED DURING THE SOMEWHAT COLDER MONTHS OF APRIL, MAY AND THE EARLY PART OF JUNE.

Date of Hatching	Sex	Number of Molts	Stadium I	Stadium II	Stadium III	Stadium IV	Stadium V	Post-embryonic development	Date of Last Molt
April 8, 1910	♂	4	14	12	10	14		50	May 28
" 11, "	♂	4	16	10	8	11		45	" 23
" 14, "	♂	4	14	8	8	16		46	" 27
" 16, "	♂	4	12	10	10	14		46	" 30
	♂	4	13	9	11	15		48	June 3
Averages			13.8	9.8	9.4	14		47	
April 5, 1910	♂	5	15	9	8	12	14	58	June 2
" 10, "	♂	5	16	10	9	11	13	59	" 8
" 11, "	♂	5	13	8	9	12	15	57	" 7
" 11, "	♂	5	14	10	8	11	13	56	" 6
" 18, "	♂	5	11	10	10	12	12	55	" 12
Averages			13.8	9.4	8.8	11.6	13.4	57	
April 9, 1910	+0+0+0+0	5	15	8	10	11	14	57	June 5
" " " "	+0+0+0+0	5	17	9	8	10	14	58	" 6
" 10, "	+0+0+0+0	5	17	9	8	12	12	57	" 6
" 12, "	+0+0+0+0	5	14	9	8	13	13	57	" 8
" 23, "	+0+0+0+0	5	11	9	10	12	11	53	" 15
Averages			14.8	8.8	8.8	11.6	12.8	56.4	

required about the same amount of time (46.8 days) as the latter (47 days). The female, which under nearly normal conditions cast its skin six times, required 53 days to complete its post-embryonic development, while the females which molted five times, while kept in a cold temperature, required

56.8 days (Table V). A comparison of the averages of corresponding stadia of the male and female Phasmids which were subjected to differences in temperature, shows that the interval between molts is longer on an average when the insects are kept in a cold temperature. It is evident, thus, that *a low temperature lengthens, on an average, the interval between molts.*

TABLE V.

AVERAGES IN DAYS OF THE STAGES BETWEEN MOLTS OF DIAPHEROMERA FEMORATA REARED UNDER NEARLY NORMAL CONDITIONS IN JUNE, JULY AND AUGUST, AND IN THE SOMEWHAT COLDER MONTHS OF APRIL, MAY AND THE EARLY PART OF JUNE.

Temperature	Sex	Number of Molts	Stadium I	Stadium II	Stadium III	Stadium IV	Stadium V	Stadium VI	Post-embryonic development
Normal Low	♂	5	9.8	8	8.2	9.8	11		46.8
		4	13.8	9.8	9.4	14			47
Normal Low	♀	6	8	7	9	8	9	12	53
		5	14.8	8.8	8.8	11.6	12.8		56.8

It is apparent that the effect of temperature on the duration of the stages, and the influence of temperature in determining the number of molts, are two entirely different problems. To ascertain what effect temperature has on the number of molts that the walking-stick undergoes, the following table should be examined:

An examination of Table VI shows that of the five specimens reared under the high temperature, three molted six times and not a single individual four times; also, of the fifteen Phasmids that were kept at the low temperature, five molted four times, ten five times, and not a single specimen six times. While the number of *Diaperomera* kept at the low and high temperatures is not exceedingly large, still these results show that *a high temperature has a tendency to increase the number of molts, while a low temperature decreases the*

*number.* In a previous paper (I) attention has already been called to the fact that "we have reared a number of *Diaperomera* which were hatched on the same day, fed with the same kind of food and kept in the same breeding cages throughout their entire life history under exactly the same kind of condi-

TABLE VI.

PER CENT. OF MALE AND FEMALE DIAPEROMERA FEMORATA WHICH MOLTED FOUR, FIVE OR SIX TIMES UNDER THE DIFFERENT TEMPERATURES.

Temperature	Number of Molts	Number of specimens and sex	Per Cent.
High 25°-35° C.	5	2 ♂	40
	6	2 ♂, 1 ♀	60
Normal	4	18 ♂, 5 ♀	23
	5	34 ♂, 42 ♀	76
	6	1 ♀	1
Low	4	5 ♂	33 $\frac{1}{3}$
	5	5 ♂, 5 ♀	66 $\frac{2}{3}$

tions of temperature, and yet some specimens molted four times while others molted five times." The effect of temperature, therefore, does not alone explain these differences in the number of molts.

*Summary*—A low temperature lengthens, while a high temperature shortens on an average the interval between molts. A low temperature has a tendency to decrease the number of molts, while a high temperature increases the number.

## BIBLIOGRAPHY.

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